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Congenital Heart Disease

THE EFFECT OF VARIOUS RADIATION SHIELDS ON OPERATOR EXPOSURE DURING CONGENITAL CARDIAC CATHETERIZATION

Poster Contributions
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Background: Cardiac catheterization personnel are exposed to occupational radiation and its attendant health risks. Little data exist regarding the efficacy of radiation-protective equipment used in congenital catheterization laboratories (CLs).

Methods: We retrospectively reviewed data collected prospectively for a continuing quality improvement initiative in which primary CL operators wore a radiation dosimeter, external to the lead apron, during procedures on patients >20 kg. A leaded undertable skirt was used in all cases. Three additional radiation-protective devices were used at operator discretion and in any combination: a top extension to the undertable skirt, a ceiling-mounted shield, and a radiation-attenuating bismuth disposable drape placed over the patient's legs. All devices are designed for operator position at the groin. Case details, operator position, fluoroscopy time, patient air KERMA (aK, mGy), and dose-area product (DAP, µGy-m2) were recorded.

Results: Data from 136 catheterizations were studied. The median operator dose (OpD) was 12 µSv (range 0-930), and was indexed to patient aK and DAP to correct for patient factors and case times. Indexed OpD decreased significantly with each additional shield used (14.8 v. 6.6 v. 5.3 v. 1.3 µSv*1000/µGy-m2 and 12.4 v. 4.6 v. 3.9 v. 1.4 µSv*100/mGy with 1, 2, 3, and 4 shields, respectively, p<0.001). This trend was not significant in the 45 cases with the operator at head-of-bed. Combinations of shielding which included the ceiling mount had the lowest indexed OpD. The patient drape did not further reduce OpD when all 3 other shields were in use (1.3 v. 2.2 µSv*1000/µGy-m2, p=0.5; and 1.4 v. 1.7 µSv*100/mGy, p=0.4) and was associated with higher patient exposure indexed to patient weight and fluoroscopy time (4.5 v. 3.1 µGy-m2/kg-min, p=0.009; and 0.51 v. 0.38 mGy/kg-min, p=0.01).

Conclusions: Utilizing x-ray attenuating barriers in addition to a leaded table skirt can significantly decrease operator-absorbed radiation. A ceiling mounted shield may provide the greatest benefit. Routine use of radiation-attenuating patient drapes may not be warranted given minimal benefit to the operator and potential increase in patient dose.